



Climate Change & Public Health in Minnesota

City of Minneapolis

February 1, 2012
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Overview

- Climate/weather changes in MN
- Public health impacts of climate change
- A few strategies to prepare for the health impacts of climate change



Taking the Pulse Of A Changing Nation: *Findings from a Survey on Climate Change and State/Territorial Health Agencies*



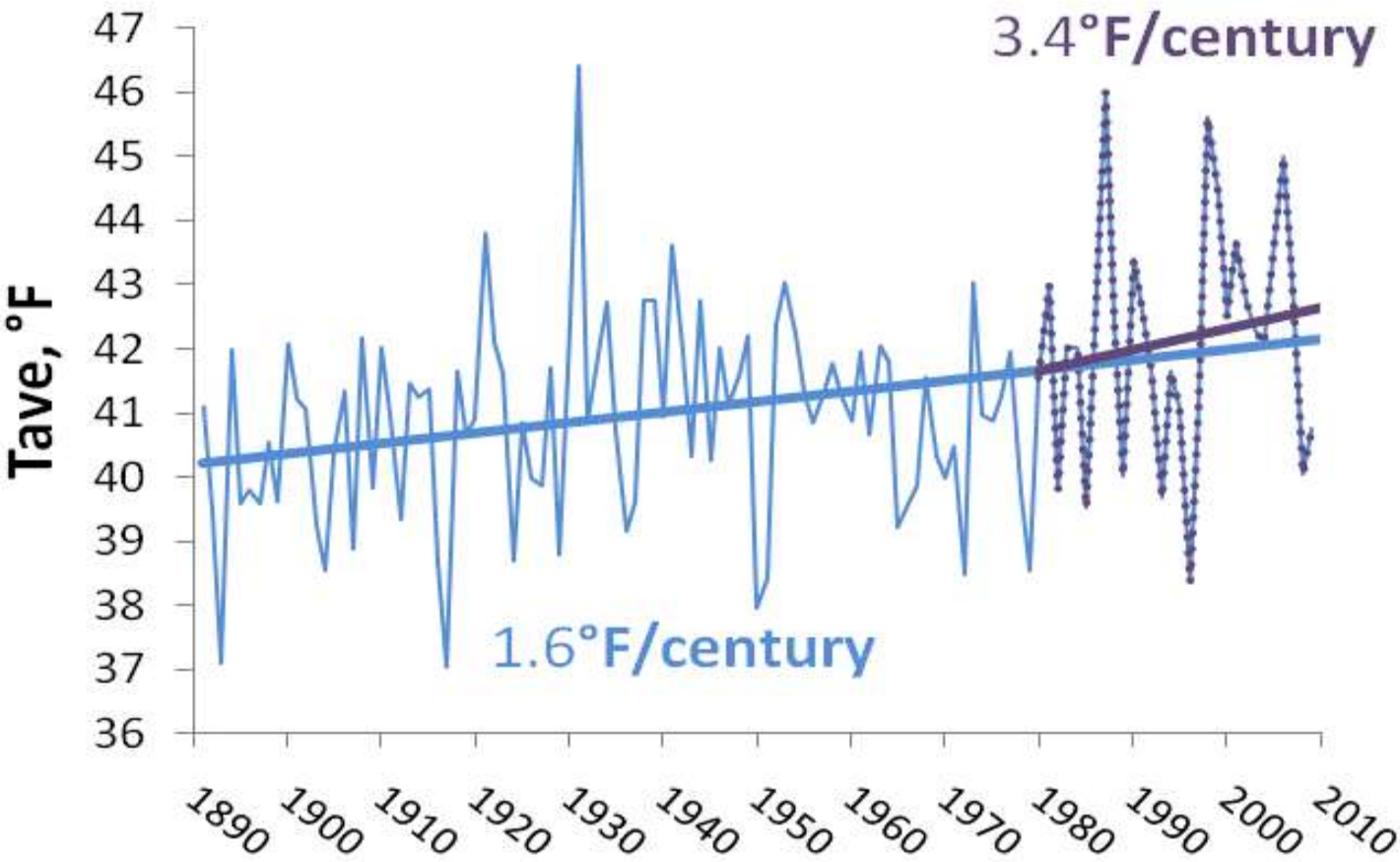


Key Points

- Large degree of uncertainty, but
 - temperatures are rising in MN
 - dew points are rising in MN
 - quantity and character of rainfall is changing MN
 - more severe storms
- Direct public health effects & indirect effects

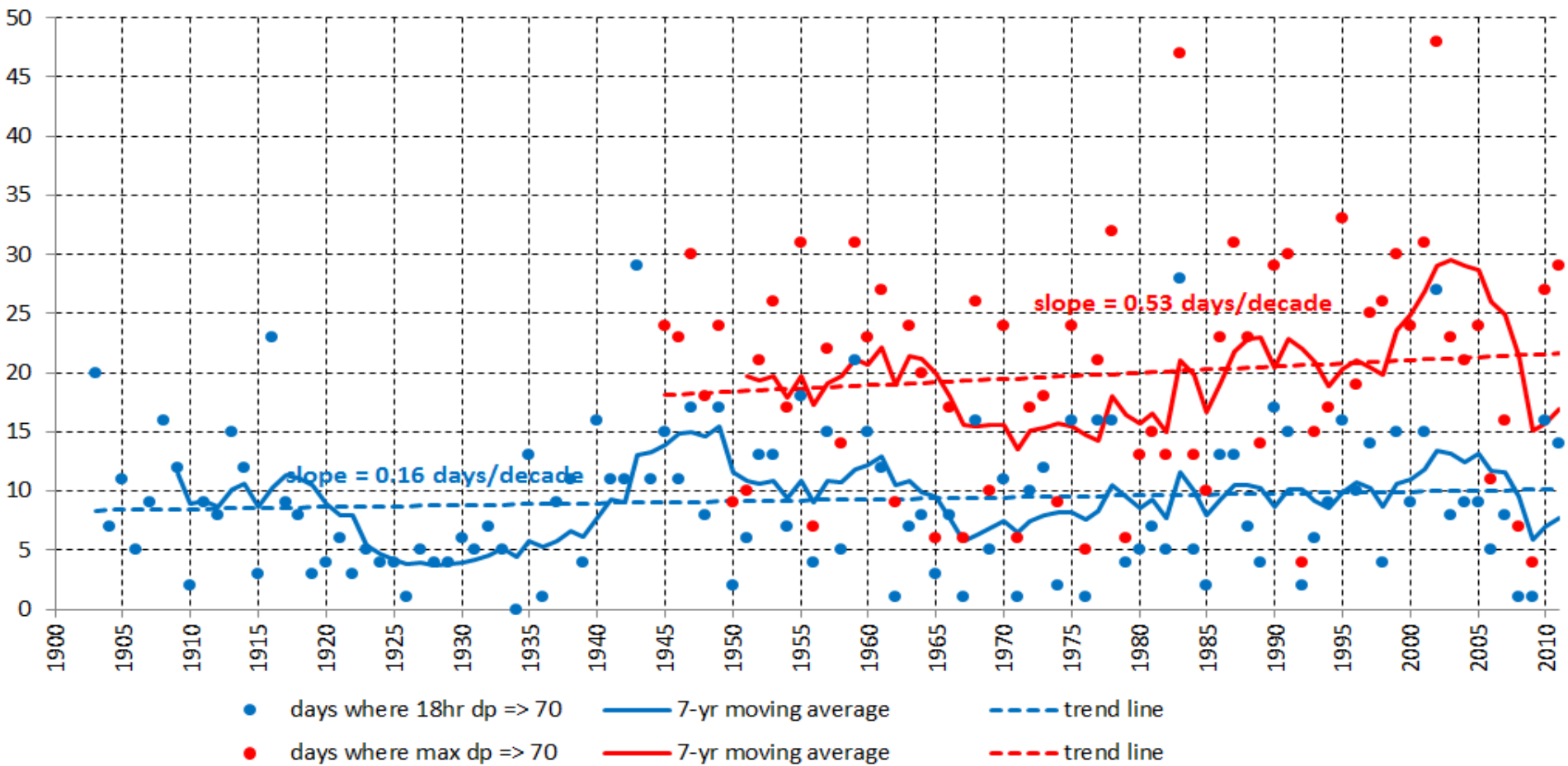


Minnesota Average Annual Temperature





Twin Cities Annual Number of Days Where Dewpoint Temperature => 70 degrees F



NOAA's National Weather Service

Heat Index


Temperature (°F)

Relative Humidity (%)

	80	82	84	86	88	90	92	94	96	98	100	102	104	106	118	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	126	130					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

 Caution

 Extreme Caution

 Danger

 Extreme Danger

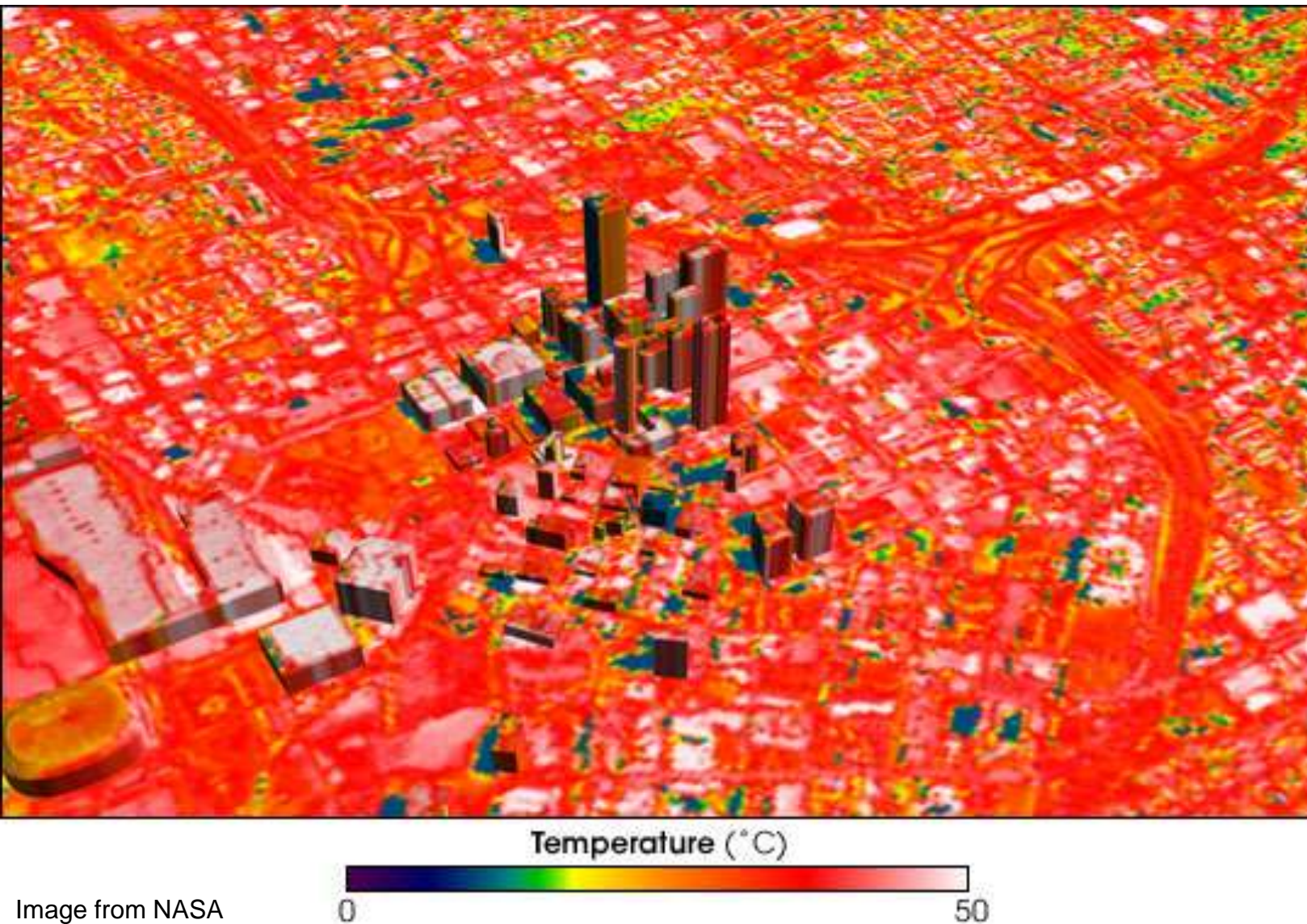
Extreme Heat and Human Health

- Heat tetany (hyperventilation)
- Heat rash
- Heat cramps
- Heat exhaustion
- Heat edema (swelling)
- Heat syncope (fainting)
- Heat/sun stroke
- Death



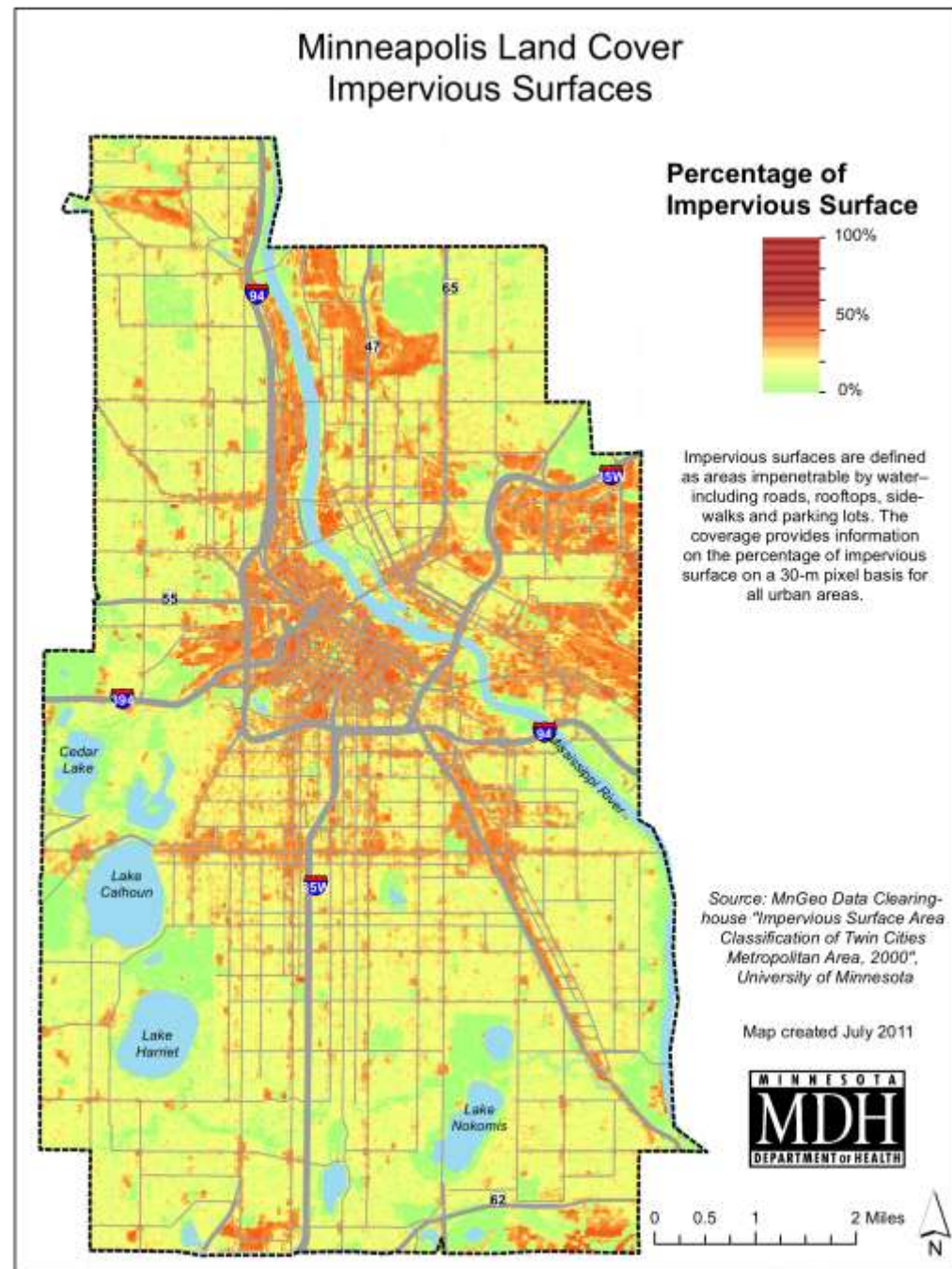
The Urban Heat Island: It's hotter in the city!

8



Urban Heat Islands

- Reduced trees and vegetation in urban areas—
Less evapo-transpiration
- Increased dark, impervious surfaces (roofs and pavement)
 - Dark surfaces absorb heat
 - Results in higher temperatures than surrounding areas, especially at night (surfaces releases heat at night)



Heat Waves

- The 1995 Chicago heat wave caused more than 600 heat-related deaths over 5 days.
- France, summer of 2003: 14,802 excess deaths
- Moscow, July/Aug 2010: over 11,000 excess deaths
 - Hurricane Katrina: 1,836 confirmed deaths
 - World Trade Center: 2,752 deaths



- From 1979 to 2003, more people in America died from extreme heat than from hurricanes, lightning, tornadoes, floods, and earthquakes **combined**.
- **Highest impact in the Northeast and Midwest**

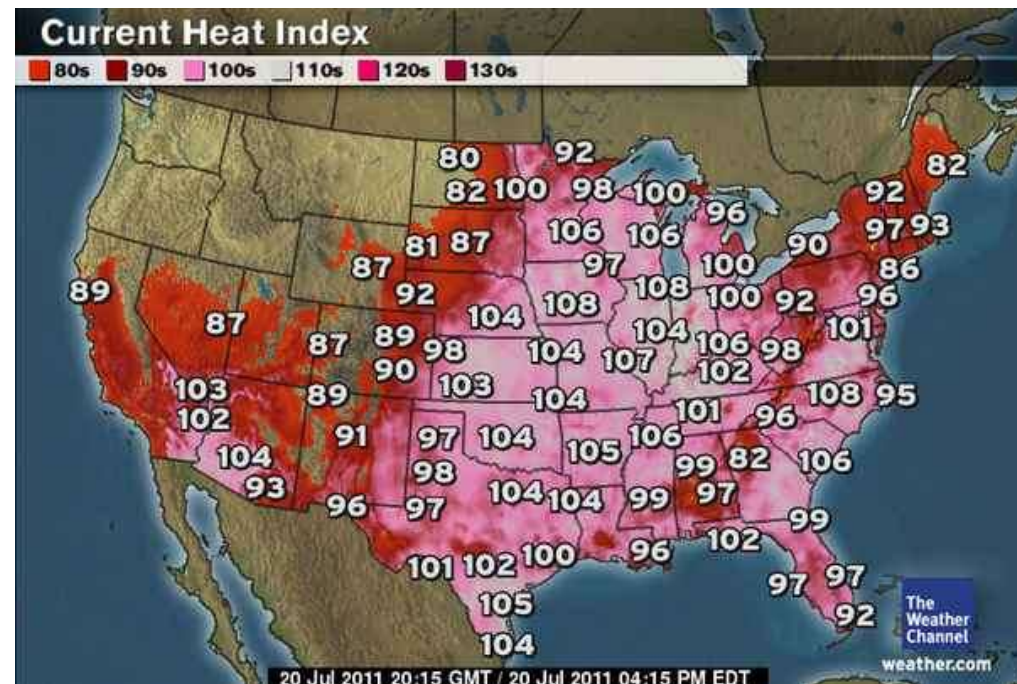
Extreme Heat Event Records

July 19, 2011:

- All-time heat index record for the Twin Cities. The air temperature reported at worst hour was 95° F and was paired with the 82° F dew point temperature

- heat index $\approx 130^\circ$
(extreme danger)

- Record state dew-point temperature: 88° F in Moorhead, felt like 119°





Other possible implications of warmer temperatures

- Heat → Increased air pollution from ground-level ozone → **Increased allergic and airway diseases**
- Longer growing season → Longer exposure times to mold, pollen and other aeroallergens → **Exacerbate allergic, respiratory and cardiovascular diseases**
- Changes in depth and duration of snow cover and soil and lake freezing → **Increase over winter survival rates of insects, pathogens and hosts**





Public Health Impacts

- Endemic vector-borne diseases in MN
 - Tick-borne diseases include Lyme disease, human anaplasmosis, and babesiosis
 - Mosquito-borne diseases include West Nile virus, La Crosse encephalitis virus, and western equine encephalitis virus

Ixodes scapularis (blacklegged tick or deer tick)



CDC/ Michael L. Levin, Ph. D. (Public Health Image Library)

David Neitzel, MPH, MDH





Climate Change and Tick-Borne Disease Risk

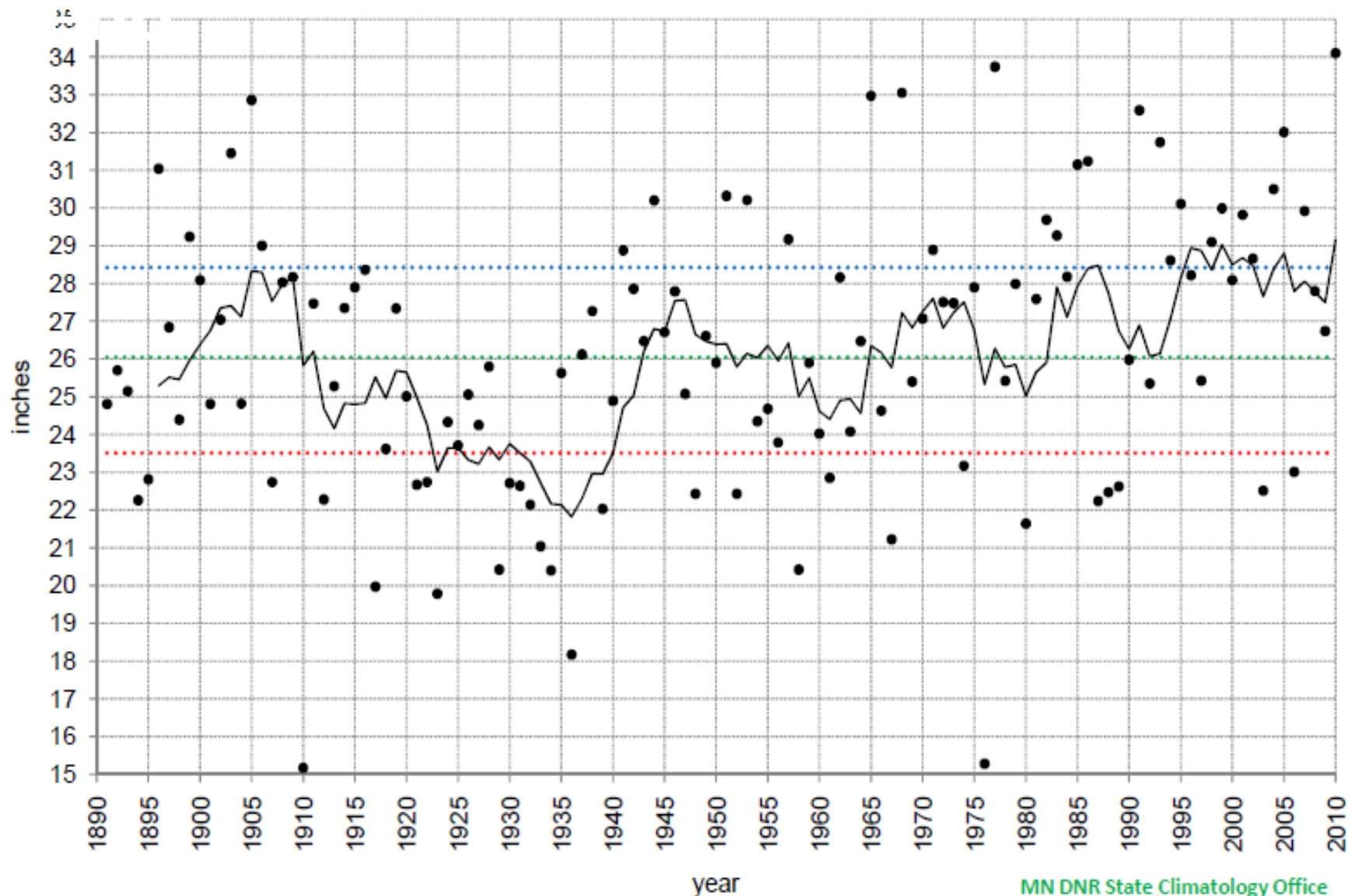
Increased temperature

- Longer tick growing/feeding season
- Lower mortality in winter
- New tick species
- New disease agents

Increased precipitation/humidity

- Increased blacklegged tick survival in warm season
- Increased time available for tick feeding each day

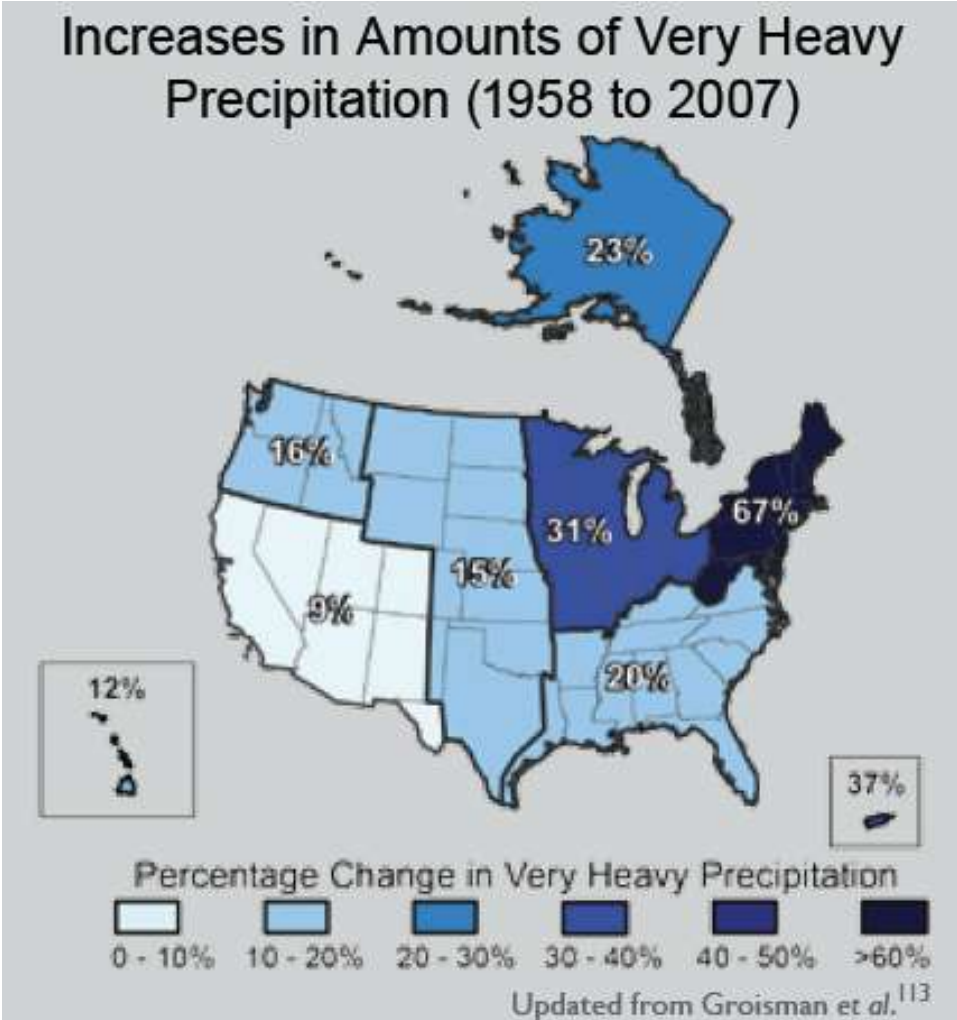
Minnesota State-Averaged Annual Precipitation



• annual precipitation 25th percentile median 75th percentile — seven-year moving average

Extreme Precipitation

- Greatest increase in very heavy precipitation in the past 50 years occurred in the Northeast and the Midwest
- Total precipitation in the Midwest and Northeast is expected to increase the most with the largest increases in heavy precipitation events



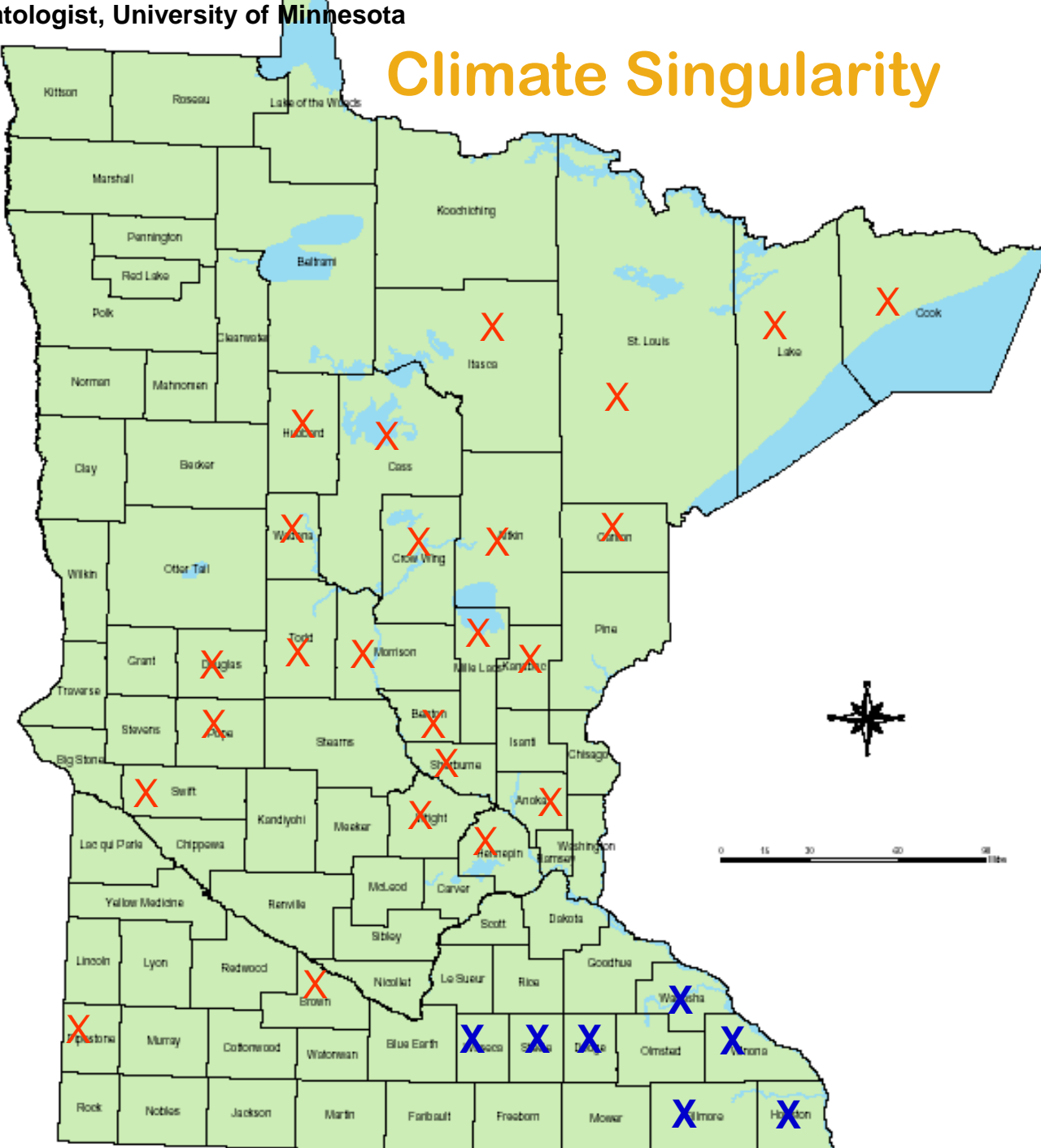
Very heavy precipitation is defined as the heaviest 1 percent of all daily events from 1958 to 2007 for each region.

Climate Singularity

X = 24 counties included in
USDA drought disaster
declaration of August 7, 2007

Note: adjacent 32 counties
were also eligible for
assistance

X= 7 counties included
in federal flood disaster
declaration of August
20, 2007 and eligible
for FEMA assistance



Public Health Impacts

■ Extreme precipitation & flooding

- Injuries
- Drowning
- Displacement
- Power loss
- Impaired water quality
- Destruction of infrastructure
- Disruption of services including healthcare services
- Houses damaged or destroyed



Moorhead, MN, March 30, 2009 --Resident wades through water to check on his flooded home on the Red River in Moorhead. Photo by Andrea Booher/FEMA



Oslo, MN, May 14, 2009 -- 35 days after the Red River flooded, the damage is still dramatic. Photo by Ed Edahl/FEMA

Public health impacts of extreme precipitation & flooding

- Mental health issues: anxiety disorders, depression, and psychological immediate effects



Public health impacts of extreme precipitation & flooding

- Water-borne illnesses
 - Caused by pathogens (e.g. *Cryptosporidium* and *Giardia*) which may increase following downpours
 - Can be transmitted in drinking water and through recreational water
- Food-borne illnesses (e.g. *Salmonellosis*)
 - Increased risk from contamination of certain food crops with feces from nearby livestock or wild animals following heavy rain and flooding



August 23, 2007 Stockton. Photo by Patsy Lynch/FEMA

1993 Milwaukee Cryptosporidium Outbreak— Occurred after heaviest rainfall in 50 years

- 1.61 M people were affected; over 400,000 w/ significant symptoms; 100 people died
- Median duration of illness was 9 days (range, 1 to 55)
- Clinical manifestations:
 - included watery diarrhea (93%),
 - abdominal cramps (84%),
 - fever (57%), vomiting (48%)
- \$31.7 million in total medical costs and \$64.6 million in total lost productivity



Photo credit: Kathy Blair & Jeffrey P. Davis, MD
Wisconsin Division of Public Health

More Severe Storms: Tornado in Minneapolis, May 22, 2011



North Minneapolis. Photo by Amanda Hankerson



North Minneapolis. Photo by Amanda Hankerson

<http://www.citypages.com/slideshow/twin-cities-tornado-damage-2011-your-photos-33379394/#9>

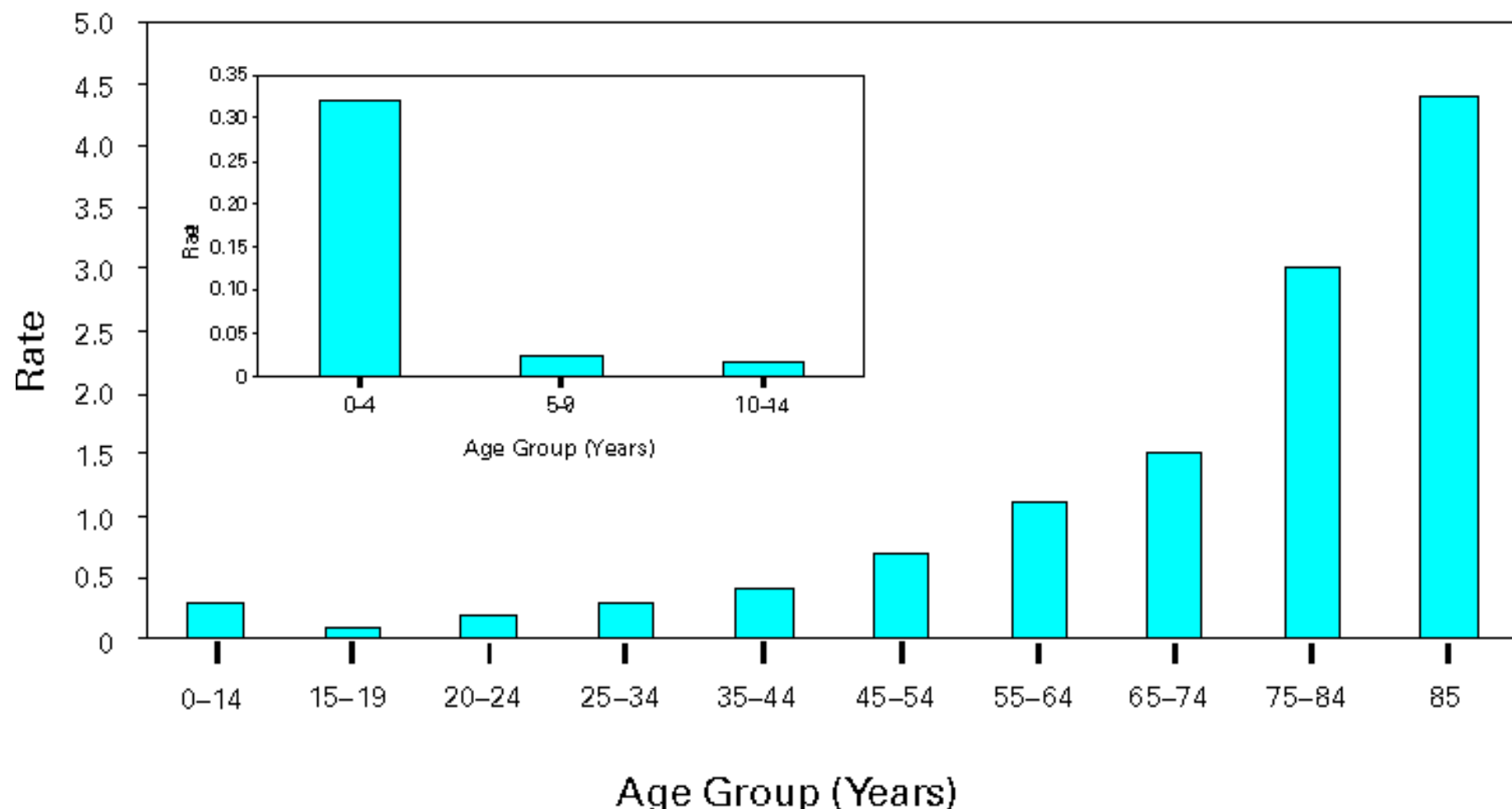


Vulnerable Populations

- Personal adaptation: anyone who has difficulty adapting to rapid changes in their environment may be at risk for health impacts due to climate change
- Awareness
- Age
- Biological/medical conditions
- Social determinants of health, income, social connections, language skills, etc.



FIGURE 1. Average annual rate* of heat-related deaths†, as the result of weather conditions, by age group — United States, 1979–1997



*Per 1 million population.

† Underlying cause of death attributed to excess heat exposure classified according to the *International Classification of Diseases, Ninth Revision* (ICD-9), as code E900.0 "due to weather conditions (deaths)."



MDH Climate Change Activities

- Developed MDH Strategic Plan for Adapting to Climate Change
- Developing training for public health professionals
- Facilitate strategic planning for local public health departments
- Developing methods for identifying vulnerable populations
- Developing a toolkit for preparing for extreme heat events
- website: <http://www.health.state.mn.us/divs/climatechange/>

MDH Extreme Heat Toolkit



EXTREME HEAT TOOL KIT

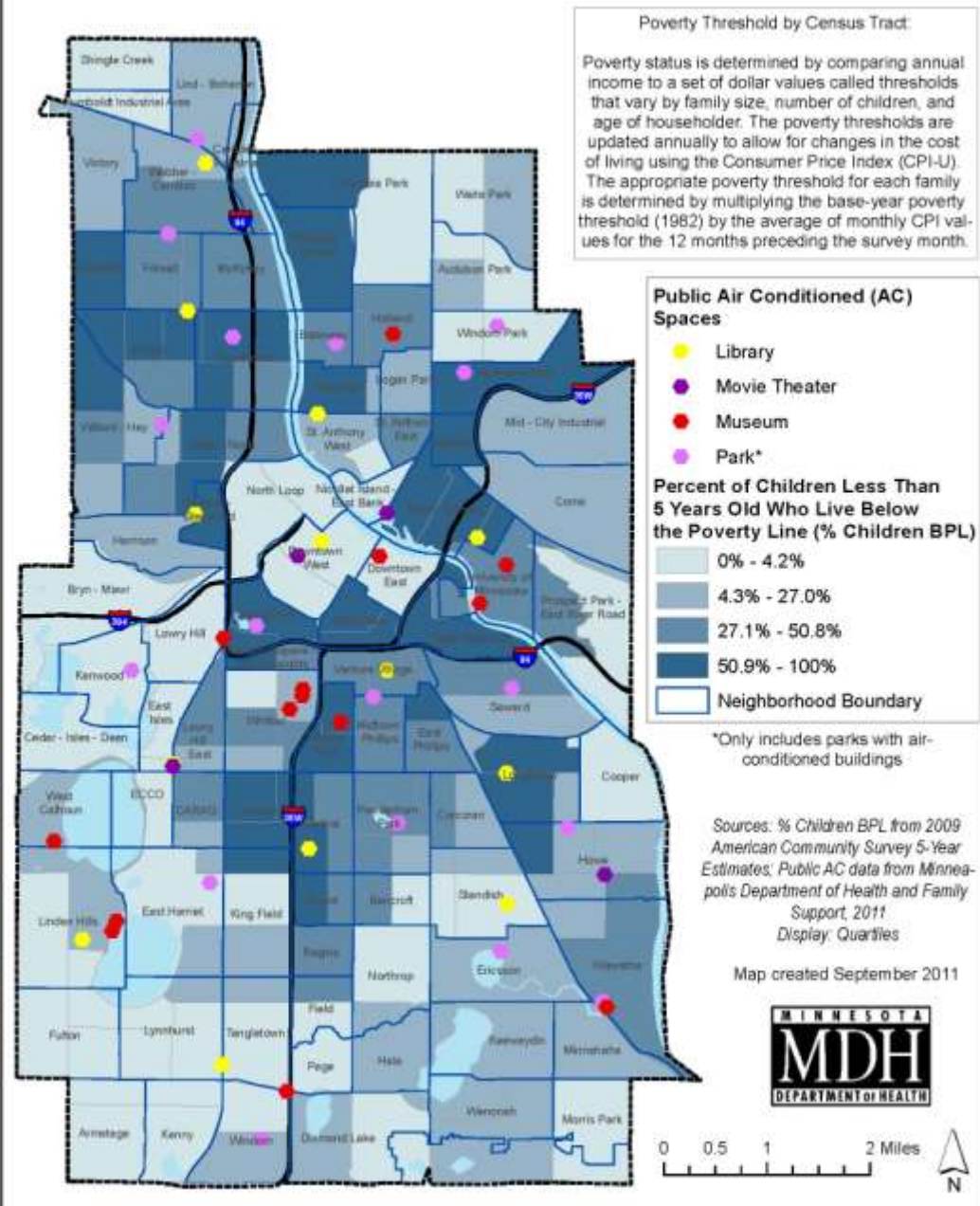
Available Spring 2012

■ **Contents include:**

- Introduction to extreme heat events
- Populations vulnerable to and risk factors for extreme heat
- Strategies to prevent heat-related deaths and illnesses for populations at risk
- Strategies to prevent heat-related deaths and illnesses for public health
- Model annex language regarding planning for extreme heat events that can be included in emergency preparedness plans
- Extreme heat mapping: using GIS to identify populations at risk & resources
- A tip sheet for individuals to prevent heat-related illnesses

Preparing for extreme heat in Minneapolis

Public Air Conditioned Spaces & Percent of Children Less Than 5 Years Old Who Live Below the Poverty Line





Summary

- Large degree of uncertainty, but...
 - temperatures are rising in MN
 - dew points are rising in MN
 - quality/quantity of rainfall is changing MN
 - more severe storms
- There are public health effects!



Thank you!

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